

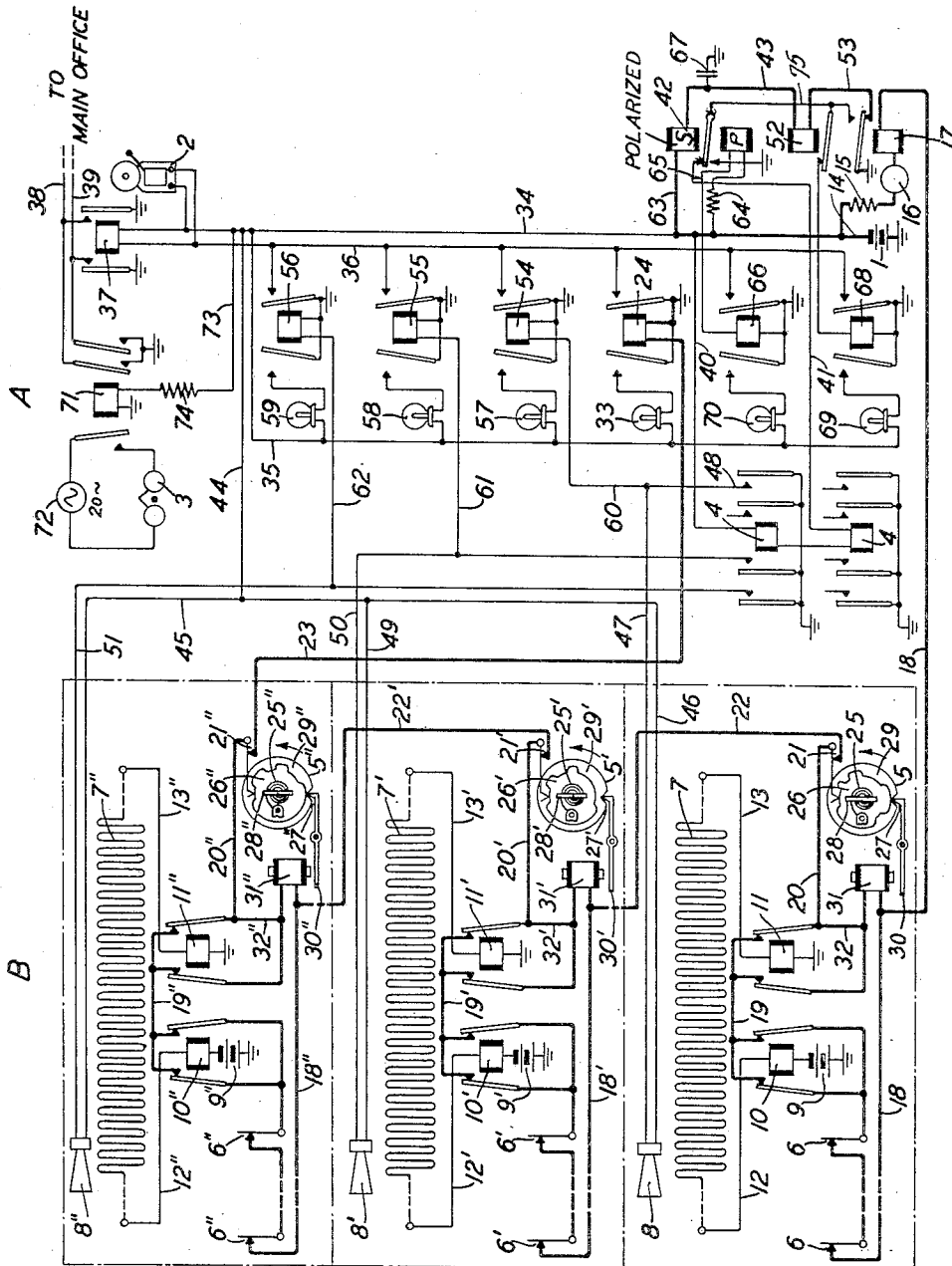
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L. J. BOWNE

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ALARM SYSTEM

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INVENTOR
L. J. BOWNE
BY *J. MacDonald*
ATTORNEY

UNITED STATES PATENT OFFICE

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ALARM SYSTEM

Langford J. Bowne, Howard Beach, N. Y., assignor
to Bell Telephone Laboratories, Incorporated,
New York, N. Y., a corporation of New York

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This invention relates to alarm systems and more particularly to an alarm system for indicating by code signals emergency conditions in a protected area.

5 The object of this invention is to provide an alarm system which will give clear and distinct code signals to indicate emergency conditions in a protected area and the location of the emergency condition.

10 A feature of this invention resides in the inclusion in the system of a condenser controlled timing relay which transforms signal pulses of different time duration sent in by a code sending device into pulses of uniform time duration.

15 The system disclosed in the drawing provides for sending code signals to a central station from various points by operating emergency signal boxes. This system also includes means by which code signals will be automatically sent in to the central station whenever a fire breaks out in a protected area. The system also provides for operating signal devices in various parts of a building whenever an emergency signal is sent to the central station.

25 Referring to the drawing, the system includes a central station A which may be located at some advantageous point in the building and an area B including the apparatus to be protected. The area B is divided off into three sections representing, for instance, three floor sections of a building. The emergency signal stations, the fire detection apparatus and the code signal sending devices in each floor are substantially the same, the only difference being in the code wheels of the code signal sending devices.

35 At the central station A are a main battery 1 for supplying energizing current to the system, a set of relays and signal lamps controlled thereby to indicate various conditions in the system, an alarm device 2 for sounding emergency alarm signals or fire alarm signals initiated from the protected premises, a battery failure alarm 3, relays to close the battery failure alarm circuit, an alarm circuit extending to a remotely located central office, and multi-contact relays 4—4 to complete circuits from the main battery to alarm signal devices located within the protected area.

40 Located on each floor in the protected area are the following: A code signal sending device 5, emergency alarm station boxes 6, networks 7 of a low melting point conductor, and a horn or other signal device 8. The networks 7 of the low melting point conductor are in a local circuit including the local battery 9, relays 10 and 11 and the conductors 12 and 13.

Under normal conditions, a closed circuit is maintained between the central station A and the protected area B as follows: Ground, main battery 1, conductor 14, resistance 15, current indicator 16, line relay 17, conductor 18, emergency alarm boxes 6—6, either left or right-hand armatures and front contacts of relay 19, conductor 19, either left or right-hand armatures and front contacts of relay 11, conductor 20, spring contacts 21, conductor 22, conductor 18', emergency alarm boxes 6'—6', either right or left-hand armatures and front contacts of relay 19', conductor 19', either right or left-hand armatures and front contacts of relay 11', conductor 20', spring contacts 21', conductor 22', conductor 18'', emergency alarm boxes 6''—6'', either right or left-hand armatures and front contacts of relay 19'', conductor 19'', either right or left-hand armatures and front contacts of relay 11'', conductor 20'', spring contacts 21'', conductor 23, winding of relay 24 to ground.

The code signal sending devices 5, 5' and 5'' are manually wound spring driven code signal sending devices each comprising a driving spring 25, a code wheel 26 driven thereby, spring contacts 21 and a latch 27. The driving spring 25 is manually wound by means of a key 28. The latch 27 normally prevents rotation of the code wheel 26 and while the particular latching means employed is not of importance in connection with the system described it may, for instance, comprise, as shown in the drawing, a notched wheel 29 and a centrally pivoted lever 30, the lever 30 having a point in engagement with the notch in the notched wheel 29. The code wheel 26 and the notched wheel 29 are rotated in a counter-clockwise direction by the driving spring 25 when the point of the centrally pivoted lever 30 is removed from the notch in the wheel 29.

40 In shunt with the emergency alarm boxes 6—6 is a trip magnet 31 to release the latch on the code signal sending device. The trip magnet 31 has a high resistance winding and is normally not sufficiently energized to release the latch on the code signal sending device. Assuming, however, that one of the emergency alarm boxes 6 is "pulled" so that the contacts in the box become separated, the current in the normally closed circuit not being able to pass through the emergency alarm boxes 6—6 will be directed through the winding of the trip magnet 31. The trip magnet 31 will then operate and release the latch in the code signal sending device. Upon operation of the trip magnet 31 and release of the centrally pivoted lever 30 from engagement with 55

the notch in the notched wheel 29, the wheel 29 and the code wheel 26 will rotate for one complete revolution. This will cause alternate separation and engagement of the spring contacts 21 in accordance with the high and low points on the code wheel and will cause the sending of a code signal to the central station A. The emergency signal boxes 6—6 are located in different sections of the building floor area and are provided for the sending of emergency signals. For instance, if a person on a certain floor level discovers a break in a water pipe or a fire in the building, an alarm may be sent into the central station by pulling one of the emergency alarm boxes 6.

In connection with the protection of telephone apparatus in a telephone exchange, the network 7 of the low melting point conductor may be distributed throughout the various cable and relay racks or other apparatus supporting means in the exchange, or may be distributed throughout any area in which a fire might break out. The local circuit including the network 7 is traced as follows: Local battery 9, winding of relay 10, conductor 12, network 7 of the low melting point conductor, conductor 13, winding of relay 11, to ground. The relays 10 and 11 are normally energized and maintain their right and left-hand armatures against the respective front contacts. In the event, however, that a fire breaks out in a cable or relay rack section, the low melting point conductor in the immediate vicinity of the fire melts and parts thereby breaking the local closed circuit. The breaking of this circuit causes deenergization of the relays 10 and 11. While it is obvious that one relay in the local circuit would be sufficient for successful operation of the system, two relays each with two armatures and corresponding front contacts have been provided as a precaution against failure of the relay to operate or faulty contacts. When the local circuit becomes broken, the relays 10 and 11 become deenergized. The armatures are released from engagement with the front contacts and the code signal sending device 5 is brought into operation. For instance, when relays 10 and 11 are deenergized the circuit including the emergency alarm boxes 6—6 and conductor 19 is broken. Current passing over the circuit from the central station will then have to traverse the winding of the trip magnet 31. The trip magnet 31 thereupon operates to release the point of the centrally pivoted lever 30 from engagement with the notch in the wheel 29.

Assuming that the local circuit in the first floor section has been broken by melting of the low melting point conductor in the network 7 and the relays 10 and 11 have become deenergized and have released their armatures from engagement with the front contacts, the circuit from the central station would then be as follows: Ground, main battery 1, conductor 14, resistance 15, current indicating device 16, line relay 17, conductor 18, winding of trip magnet 31, conductor 32, conductor 20, spring contacts 21, conductor 22, conductor 18', emergency alarm boxes 6'—6', either right or left-hand armatures and front contacts of relay 10', conductor 19', either right or left-hand armatures and front contacts of relay 11', conductor 20', spring contacts 21', conductor 22', conductor 18'', emergency alarm boxes 6''—6'', either right or left-hand armatures and front contacts of relay 10'', conductor 19'', either right or left-hand armatures and front contacts of

relay 11'', conductor 20'', spring contacts 21'', conductor 23, winding of relay 24 to ground.

Upon turning of the code wheel 26 in a counter-clockwise direction under the action of driving spring 25, spring contacts 21 will be alternately opened and closed in accordance with the high and low points in the code wheel 26. Line relay 17 and relay 24 will then be alternately deenergized and energized in accordance with the code signals from the code signal sending device 5. Code signal lamp 33 will then flash in accordance with the code signal. The circuit to the code signal lamp 33 is as follows: Ground, main battery 1, conductor 14, conductor 34, conductor 35, code signal lamp 33, back contact and left-hand armature of relay 24 to ground.

The alarm 2 will also operate in accordance with the code signal coming in. The circuit through the alarm 2 is as follows: Ground, main battery 1, conductor 14, conductor 34, alarm 2, conductor 36, back contact and right-hand armature of relay 24 to ground.

Relay 37 will also operate to put ground on conductors 38 and 39 to extend the code signal to alarm devices located at the main central office, not shown. The circuit of relay 37 is as follows: Ground, main battery 1, conductor 14, conductor 34, winding of relay 37, conductor 36, back contact and right-hand armature of relay 24 to ground.

When an emergency alarm box 6 has been "pulled" or when a break has occurred in the network 7, the code signal sending device 5 is brought into operation and the line relay 17 becomes deenergized. Deenergization of the line relay 17 completes a circuit for the multi-contact relays 4—4 as follows: Ground, main battery 1, conductor 14, conductor 34, conductor 40, windings of multi-contact relays 4—4, conductor 41, front contact and armature of polarized relay 42, conductor 75, back contact and armature of line relay 17, to ground. Multi-contact relays 4—4 are thereupon operated to complete the circuits to the signal devices 8, 8' and 8'', which are located in the different floor sections of the protected area. The circuits to these signal devices are as follows: To the signal device 8, ground, main battery 1, conductor 14, conductor 34, conductor 44, conductor 45, conductor 46, signal device 8, conductor 47, conductor 48, outer right-hand front contact and armature of multi-contact relay 4 to ground. To the signal device 8', the circuit is the same as for signal device 8 to and including conductor 45 where it branches off over conductor 49. From thence the circuit continues through signal device 8', conductor 50, to inner left-hand front contact and armature of multi-contact relay 4 to ground. To the signal device 8'' the circuit is the same as for signal device 8 to and including conductor 45, thence through signal device 8'', conductor 51 to the outer left-hand front contact and armature of multi-contact relay 4 to ground. The signal devices 8, 8' and 8'' operate to produce a signal in the various floor sections in accordance with the code signal coming from whichever of the code signal sending devices is operated. While normally there is a complete circuit through the multi-contact relays 4—4, through the armature and front contact of time supervisory relay 52 and the winding of relay 53, the winding of relay 53 is of a sufficiently high resistance value to prevent operation of the multi-contact relays 4—4. The signal supervisory relays 54, 55 and 56 are provided for supervision of the signal de-

vices 8, 8' and 8'', respectively, and are normally energized. These relays, however, become de-energized when the multi-contact relays 4—4 are energized and the signal devices 8, 8' and 8'' operate. Signal supervisory relays 54, 55 and 56 through their left-hand armatures and corresponding back contacts control the respective lamp signals 57, 58 and 59 which flash in accordance with the code signal. These supervisory relays also through their right-hand armatures and corresponding back contacts provide ground for the alarm 2 and relay 37. The circuit for the normal energization of the signal supervisory relay 54 is the same as for the signal device 8 to and including conductor 47 where it branches off through conductor 60 and through the winding of signal supervisory relay 54 to ground. The circuit for the normal energization of signal supervisory relay 55 is the same as for the signal device 8' to and including conductor 50 from whence it branches off through conductor 61 and through the winding of signal supervisory relay 55 to ground. The circuit for the normal energization of signal supervisory relay 56 is the same as for the signal device 8'' to and including conductor 51 from whence it branches off through conductor 62 and through the winding of signal supervisory relay 56 to ground. While there is normally a complete circuit through each of the signal devices 8, 8' and 8'' through the winding of the respective signal supervisory relays 54, 55 and 56, there is not sufficient current flowing to operate the signal devices 8, 8' and 8'' due to the resistance in the windings of the respective supervisory relays 54, 55 and 56.

To transform signal impulses sent by the code signal sending devices into pulses of the proper duration to satisfactorily operate the signal devices 8, 8' and 8'' and to limit the duration of operation of the signal devices should trouble occur in the circuit, the polarized relay 42 and time supervisory relay 52 are provided.

Polarized relay 42 is normally maintained energized over the circuit as follows: Ground, main battery 1, conductor 14, conductor 34, conductor 63, secondary winding of polarized relay 42, conductor 43, winding of time supervisory relay 52, conductor 53, front contact and armature of line relay 17 to ground. The primary winding of polarized relay 42 is energized as follows: Ground, main battery 1, conductor 14, conductor 34, resistance 54, primary winding of polarized relay 42, conductor 65, winding of relay 66 to ground. A condenser 67 connected to ground on one side is provided in connection with the secondary winding of polarized relay 42. When the line relay 17 becomes deenergized and releases its armature thus breaking the normal circuit for the secondary winding of polarized relay 42, condenser 67 charges and maintains the secondary winding of polarized relay 42 energized for a brief period. When the condenser 67 becomes fully charged, secondary winding of the polarized relay 42 becomes deenergized and is overcome by the pull of the primary winding. The armature of polarized relay 42 thereupon moves against its back contact and breaks the circuit of the multi-contact relays 4—4. The time supervisory relay 52 also releases its armature and breaks the circuit of relay 68. Relay 68 releases its armatures and puts ground through its right-hand armature on the alarm signal 2 and relay 37. Through the release of its left-hand armature, relay 68 puts ground on lamp signal 69. Relay 66 is normally energized from the main

battery 1 by way of resistance 54, the primary winding of polarized relay 42 and conductor 65 and will release to cause the sounding of the alarm 2 and lighting of the lamp 70 when any trouble occurs in the primary circuit of the polarized relay 42.

The primary winding of the polarized relay 42 makes the duration of charging of the condenser 67 independent of battery voltage. It opposes the secondary winding with the result that the period for which the charging of the condenser holds the polarized relay operated represents the difference in effect of the two windings and is not therefore appreciably affected by the battery voltage. The polarized relay 42 thus insures a short blast or signal from the signal devices 8, 8' and 8'' each time the alarm circuit is opened.

In the event of failure of the main battery 1, relay 71 becomes deenergized and closes a circuit through its left-hand armature and back contact to an alarm 3 which is energized from some outside current supply source such, for instance, as a source of 20-cycle A. C. indicated at 72. The deenergization of relay 71 also puts ground on conductors 33 and 39 which lead to alarm signal devices located at a remote central office, not shown. Relay 71 is normally energized from the main battery 1 by way of conductor 14, conductor 34, conductor 73, resistance 74, winding of relay 71 to ground.

The system shown on the drawing is an adaptation of the present invention to a complete emergency signal and automatic fire alarm system. The invention, however, is not limited to the particular system shown in the drawing but may obviously be used in various other automatic alarm and fire detection systems without departing from the spirit of the invention as set forth in the following claims.

What is claimed is:

1. The combination of a relay, a normally closed circuit for said relay, said relay being responsive to breaks of varying lengths of time in said closed circuit, said relay having normally closed contacts, a second relay normally energized over the normally closed contacts of said first relay, a circuit for said second relay including the normally closed contacts of said first relay, a second circuit for said second relay, means in said second circuit to hold said second relay operated for a predetermined time interval after said first relay releases the normally closed contacts of said first relay, and a contact released by said second relay at the end of the predetermined time interval.

2. The combination of a relay, a normally closed circuit for said relay, said relay being responsive to interruptions of current in said normally closed circuit, said relay having normally closed contacts, a second relay normally energized over the normally closed contacts of said first relay, an operating circuit for said second relay including the normally closed contacts of said first relay, said second relay having contacts normally held closed, a holding circuit for said second relay, and an electrical capacitance element of predetermined value in said holding circuit to maintain said holding circuit operative for a predetermined time interval after said first relay has released.

3. The combination of a relay, a normally closed circuit for said relay, said relay having normally closed contacts and being responsive to current interruptions in said normally closed circuit, a polarized relay having a primary and a

secondary winding, the secondary winding being normally energized over the normally closed contacts of said first relay, an operating circuit for said secondary winding including the normally closed contacts of said first relay, an operating circuit for said primary winding, said polarized relay having contacts normally held closed by said secondary winding, a holding circuit for said secondary winding of said polarized relay, and a condenser of predetermined value in said holding circuit to maintain said secondary winding effective to hold the contacts of said polarized relay closed for a predetermined time interval after said first relay has released, said primary winding of said polarized relay opposing said secondary winding to such an extent as to make the duration of charging of said condenser and operation of said polarized relay, in releasing its contacts, independent of battery voltage.

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